

HAC T-COIL TEST REPORT

Applicant: FlexSource
Address: 1250 Shames Drive, Westbury, NY 11590, USA
Equipment Type: Smart phone
Model Name: SC6513
Brand Name: Sense Go
FCC ID: 2BWV2-SC6513
Test Standard: 47 CFR Part 20.19
(refer section 3.1)
HAC Compliance: PASS
Sample Arrival Date: Jul. 14, 2026
Test Date: Jul.14, 2026 - Aug. 27, 2026
Date of Issue: Sep. 02, 2026

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Zhang Jiwei**Checked by:** Xu Rui**Approved by:** Liao Jianming
(Technical Director)*Zhang Jiwei**Xu Rui**Jim Liao*

Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Sep. 02, 2026</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	601, Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☐ Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen, Guangdong ☒ 1/F., Building B, Ganghongji High-Tech Intelligent Industrial Park, No.1008, Songbai Road, Yangguang Community, Xili Subdistrict, Nanshan District, Shenzhen, Guangdong
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

1.3 Test Environment Condition

Ambient Temperature	18°C to 25°C
Ambient Relative Humidity	30% to 70%
Ambient noise is checked and found very low and in compliance with requirement of standards.	

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	FlexSource
Address	1250 Shames Drive, Westbury, NY 11590, USA

2.2 Manufacturer Information

Manufacturer	FlexSource
Address	1250 Shames Drive, Westbury, NY 11590, USA

2.3 General Description for Equipment under Test (EUT)

EUT Name	Smart phone
Model Name Under Test	SC6513
Series Model Name	Sense Go
Description of Model name differentiation	The only differences are appearance, trade name, and model number for trading purposes. (this information provided by the applicant)
Hardware Version	A306_M_V2.0
Software Version	SC6513_v1.0.0_20260609
Dimensions (Approx.)	165*76.8*10.2mm
Weight (Approx.)	193g
EUT ID	CC26050177-001: S14, S15
SN or IMEI Number	CC26050177-001-S14 IMEI 990019122712005
	CC26050177-001-S15 IMEI 990019122712013

2.4 Ancillary Equipment

Ancillary Equipment 1	Li-Polymer Battery	
	Brand Name	N/A
	Model No.	BTE-4003
	Serial No.	N/A
	Capacitance	Rated: 4000mAh Typical: 4050mAh
	Rated Voltage	3.85 V
	Limited Voltage	4.4 V
	Manufacturer	PHENIX NEW ENERGY(HUIZHOU)CO.,LTD.

2.5 Technical Information

Network and Wireless connectivity	2G Network GSM/GPRS/EDGE 850/1900 3G Network WCDMA/HSDPA/HSUPA+ Band 2/4/5 4G Network LTE FDD Band 2/4/5/12/13/17/25/26/66/71 LTE TDD Band 41 Bluetooth (BR+EDR+BLE) 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20/40) 5G WIFI 802.11a, 802.11n(HT20/40), 802.11ac(VHT20/40/80)
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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	GSM, WCDMA, LTE, WLAN, Bluetooth		
Frequency Range	GSM 850	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	GSM 1900	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	WCDMA Band 2	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	WCDMA Band 4	TX: 1710 ~ 1755 MHz	RX: 2110 ~ 2155 MHz
	WCDMA Band 5	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	LTE Band 2	TX: 1850~1910 MHz	RX: 1930~1990 MHz
	LTE Band 4	TX: 1710~1755 MHz	RX: 2110~2115 MHz
	LTE Band 5	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	LTE Band 12	TX: 699-716 MHz	RX: 729~746 MHz
	LTE Band 13	TX: 777-787 MHz	RX: 746~756 MHz
	LTE Band 17	TX: 704-716 MHz	RX: 734~746 MHz
	LTE Band 25	TX: 1850~1915 MHz	RX: 1930~1995 MHz
	LTE Band 26	TX: 814~849 MHz	RX: 859~894 MHz
	LTE Band 66	TX: 1710 ~ 1780 MHz	RX: 2110 ~ 2200 MHz
	LTE Band 71	TX: 663 ~ 698 MHz	RX: 617 ~ 652 MHz
	LTE Band 66	TX: 1710 ~ 1780 MHz	RX: 2110 ~ 2200 MHz
	LTE Band 41	TX: 2496 ~ 2690 MHz	RX: 2496 ~ 2690 MHz
	802.11b/g/n(HT20/HT40)	2412 ~ 2462 MHz	
	802.11a/ /n(HT20/HT40) /ac(VHT20/VHT40 /VHT80)	5150 ~ 5250 MHz	
		5725 ~ 5850 MHz	
Bluetooth	2402 ~ 2480 MHz		
Antenna Type	FPC Antenna		
DTM	N/A		
Hotspot Function	Support		
Power Reduction	Support		
Exposure Category	General Population/Uncontrolled exposure		
Product Type	Portable Device		
EUT Type	☒ Production unit	☐ Identical prototype	

2.6 EUT Air Interface description

All air interfaces which support voice capabilities over a managed CMRS, or pre-installed OTT VoIP applications were evaluated.

Air Interface	Bands	Type	C63.19 Tested	Simultaneous Transmitter	Name of Voice Service	Power Mode
GSM	850	VO	Yes	BT/WiFi	CMRS Voice	Off
	1900					Off
	GPRS/EDGE	DT/VD	Yes	BT/WiFi	Google Meet	Off
WCDMA	Band 2	VO	Yes	BT/WiFi	CMRS Voice	Off
	Band 4					Off
	Band 5					Off
	HSPA	VD	Yes	BT/WiFi	Google Meet	Off
LTE (FDD)	Band 2	VD	Yes	BT/WiFi	VoLTE/Google Meet	Off
	Band 4					Off
	Band 5					Off
	Band 12					Off
	Band 13					Off
	Band 17					Off
	Band 25					Off
	Band 26					Off
	Band 66					Off
	Band 71					Off
LTE (TDD)	Band 41	VD	Yes	BT/WiFi	VoLTE/Google Meet	Off
WiFi	2.4G	VD	Yes	WWAN/BT	CMRS Voice/Google Meet	Off
	U-NII-1					Off
	U-NII-3					Off
Bluetooth	2.4G	DT	N/A	WWAN/WiFi	N/A	N/A

VO: Legacy Cellular Voice Service

DT: Digital Transport only (no voice)

VD:IP Voice Service over Digital Transport

CMRS: Commercial Mobile Radio Service

For protocols not listed in Table 6.1 of ANSI C63.19-2019, the average speech level of -20 dBm0 should be used. Google Meet (OTT VoIP) uses an input level of -20 dBm0 for testing.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 20.19	Hearing aid-compatible mobile handsets.
2	ANSI C63.19-2019	American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids
3	KDB 285076 D01 HAC Guidance v06r04	Provides equipment authorization guidance for mobile handsets subject to the requirements of Section 20.19 for hearing aid compatibility
3	KDB 285076 D02 T-Coil testing for CMRS IP v04	GUIDANCE FOR PERFORMING T-COIL TESTS FOR AIR INTERFACES SUPPORTING VOICE OVER IP (e.g., LTE AND Wi-Fi) TO SUPPORT CMRS BASED TELEPHONE SERVICES
5	KDB 285076 D03 HAC FAQ v01r06	HEARING AID COMPATIBILITY Frequently Asked Questions

3.2 HAC Test Configuration and Setting

For HAC RF emission testing, the EUT was linked and controlled by wireless communication test set. Communication between the EUT and the wireless communication test set was established by air link. The distance between the EUT and the communicating antenna of the test set is larger than 50 cm and the output power radiated from the wireless communication test set antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the wireless communication test set to radiate maximum output power during HAC testing.

3.3 Summary of T-Coil Results

Mode	Band	Frequency Response	Result
GSM	GSM850	PASS	PASS
	GSM1900	PASS	PASS
UMTS	Band2	PASS	PASS
	Band4	PASS	PASS
	Band5	PASS	PASS
LTE	Band2	PASS	PASS
	Band4	PASS	PASS
	Band5	PASS	PASS
	Band12	PASS	PASS
	Band13	PASS	PASS
	Band17	PASS	PASS
	Band25	PASS	PASS
	Band26	PASS	PASS
	Band66	PASS	PASS
	Band71	PASS	PASS
WiFi	Band41	PASS	PASS
	2.4G	PASS	PASS
	5.2G	PASS	PASS
	5.8G	PASS	PASS

Note1: The HAC T-Coil emission limit is specified in FCC 47 CFR part 20.19 and ANSI C63.19.

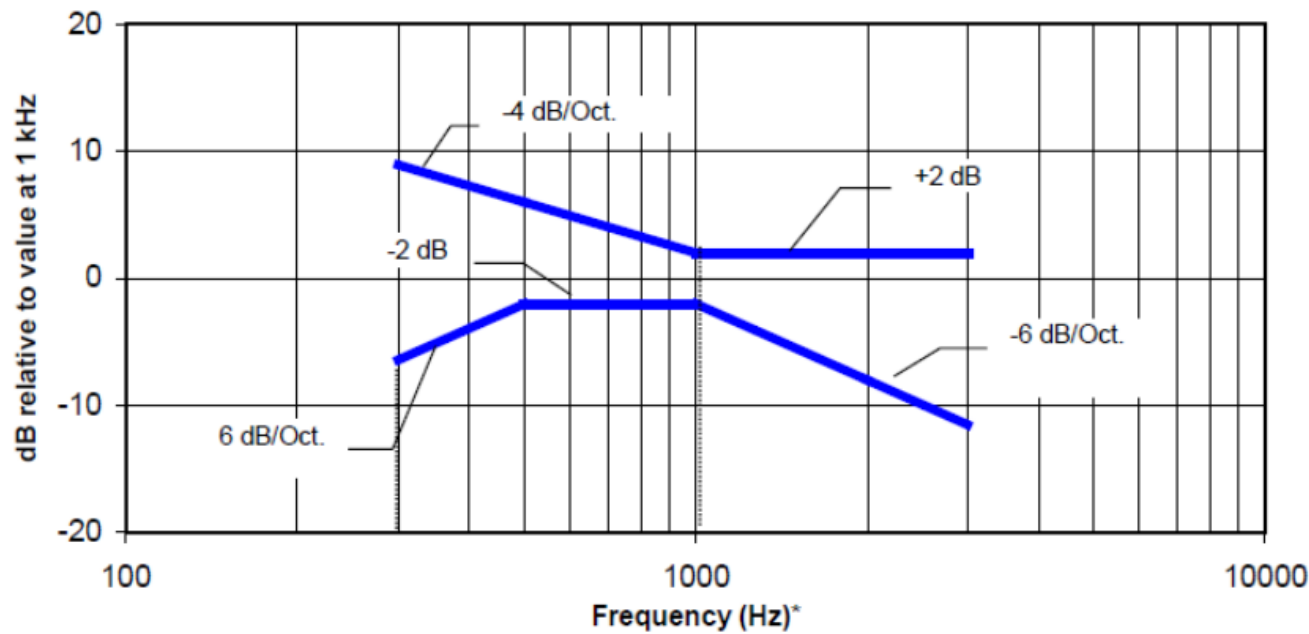
Note2: The device T-Coil emission rating is determined by the minimum rating.

3.4 T-coil Measurement Criteria

3.4.1 Frequency Response

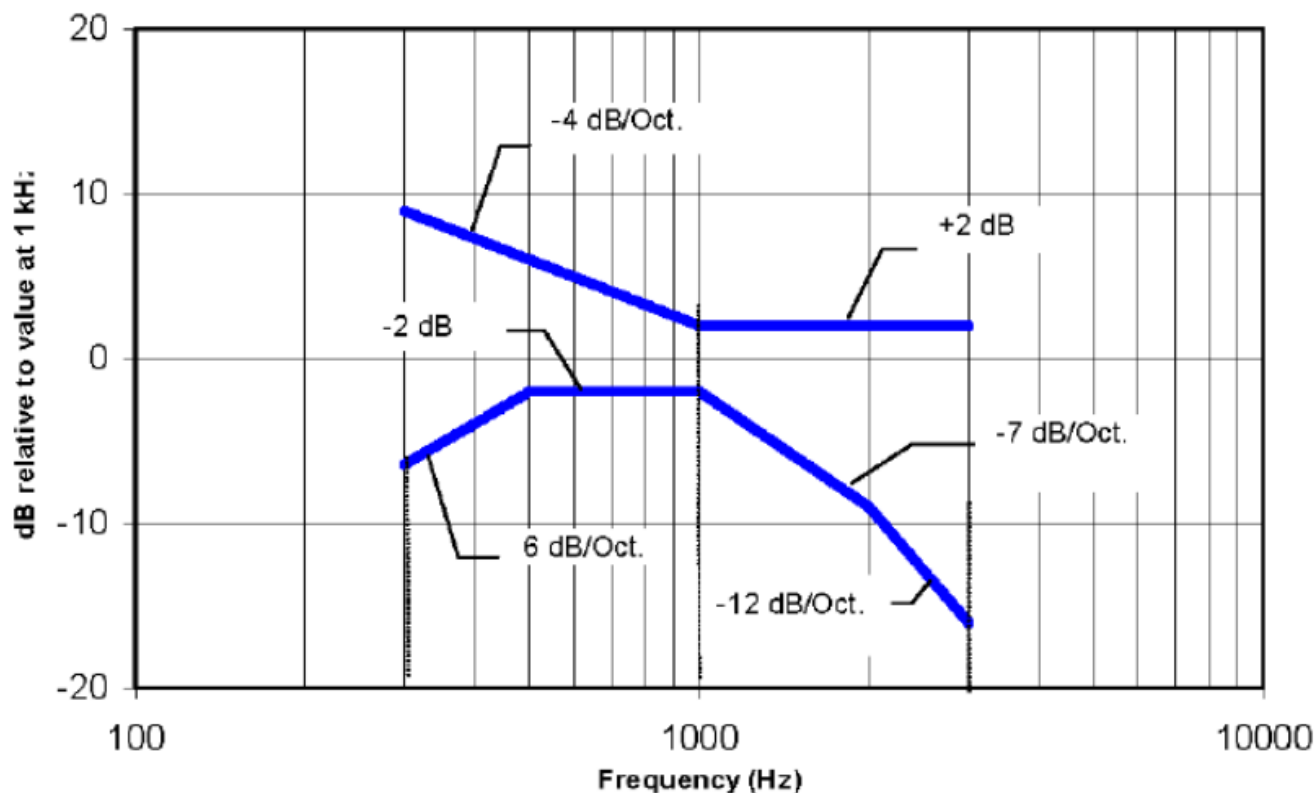
The frequency response of the magnetic field, measured in 1/3 octave bands, shall follow the response curve specified in this subclause, over the frequency range 300 Hz to 3 kHz.

Figure 6.4 and Figure 6.5 provide the boundaries for the specified frequency. These response curves are for true field strength measurements of the T-Coil signal. Thus the 6 dB/octave probe response has been corrected from the raw readings.



NOTE—Frequency response is between 300 Hz and 3 kHz.

Figure 6.4—Magnetic field frequency response for WDs with a maximum field ≤ -15 dB(A/m) at 1 kHz



NOTE—Frequency response is between 300 Hz and 3000 Hz.

Figure 6.5—Magnetic field frequency response for WDs with a maximum field that exceeds -15 dB(A/m) at 1 kHz

3.4.2 Coupling Mode Requirements

In order to comply with the requirements for T-Coil use, a WD's tested operating modes shall simultaneously meet the requirements for minimum desired ABM signal level and maximum undesired ABI field contained in this subclause at the minimum specified number of scanned locations.

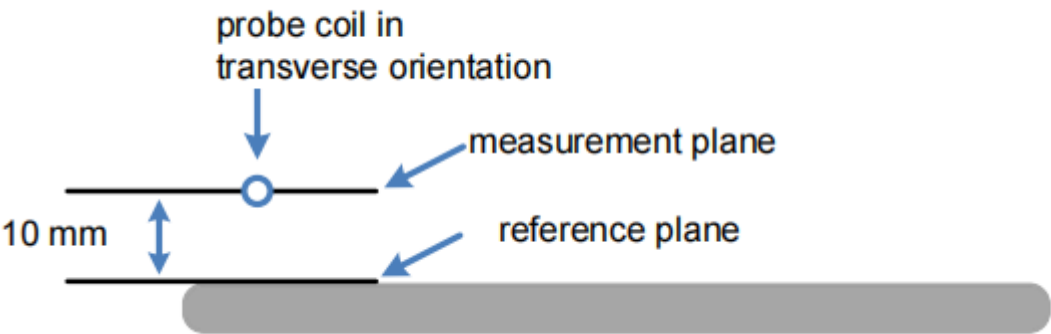
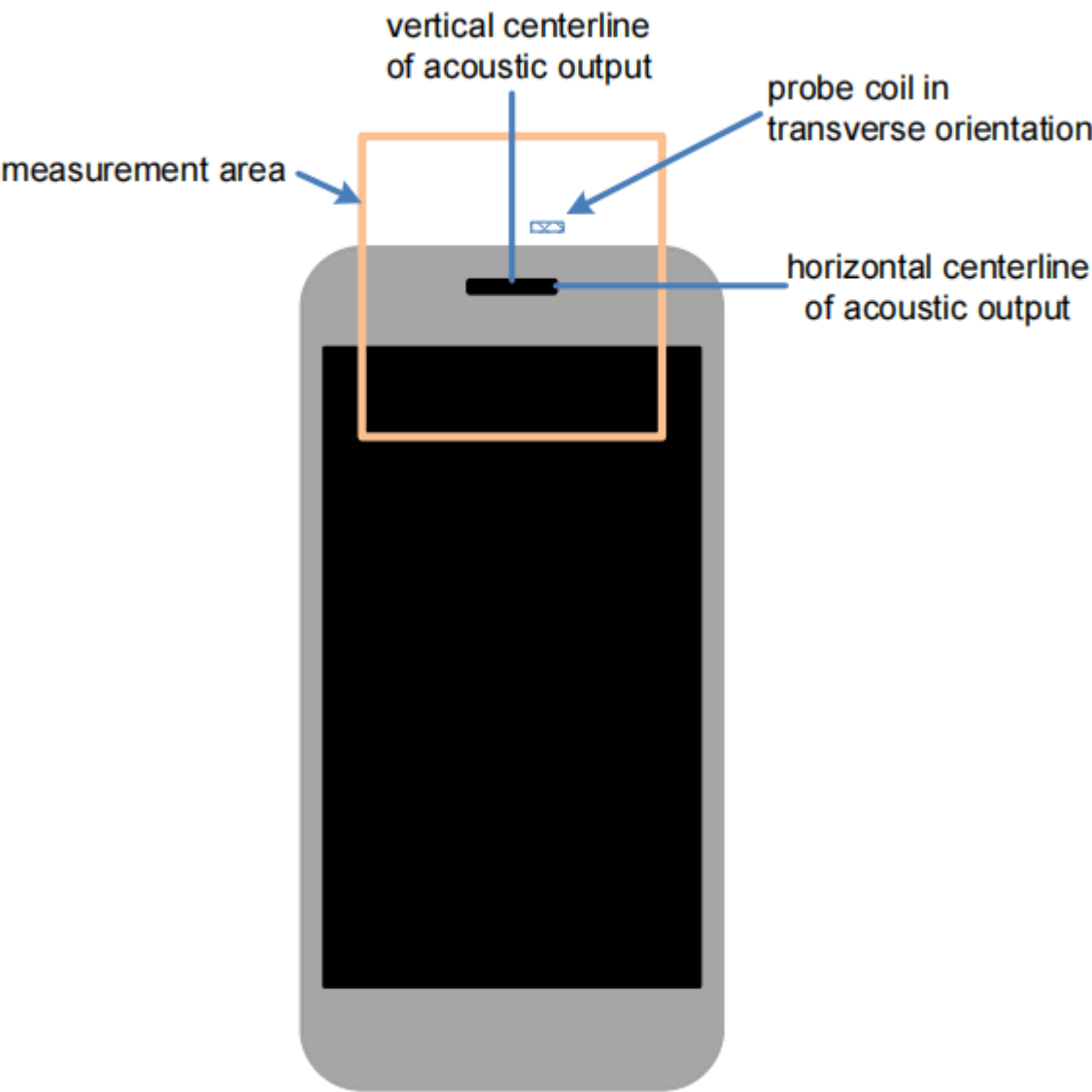
When measured as specified in this standard, there are two groups of qualifying measurement points.

Primary group: A qualifying measurement point shall have its T-Coil signal, desired ABM signal, ≥ 18 dB(A/m) at 1 kHz, in a 1/3 octave band filter. These measurements shall be made with the WD operating at a reference input level as specified in Table 6.1. Simultaneously, the qualifying measurement point shall have its weighted magnetic noise undesired ABM field ≤ -38 dB(A/m).

Secondary group: A qualifying measurement point shall have its weighted magnetic noise, undesired ABM field ≤ -38 dB(A/m). This group inherently includes all the members of the primary group.

These levels are designed to be compatible with hearing aids that produce the same acoustic output level for either an acoustic input level of 65 dB SPL or a magnetic input level of -25 dB(A/m) (56.2 mA/m)⁶ at either 1.0 kHz or 1.6 kHz. The hearing aid operational measurements are performed per ANSI S3.22-2014.

Measurement locations and reference plane to be used for the T-coil measurements.



3.4.3 ANSI C63.19 HAC T-Coil Requirements

For a WD that is expected to operate primarily in radio access technologies that include 2G GSM for legacy support, the WD shall be qualified for telecoil compatibility one of two ways:

- a) The WD shall be rated for telecoil use for all other voice operating modes, exclusive of 2G GSM, according to the criteria of 6.6.4.2 of ANSI C63.19 2019.
- b) If the WD is to be rated for telecoil use in its 2G GSM operating modes, these modes shall be qualified according to the criteria of 6.6.4.3 of ANSI C63.19 2019.

3.4.4 Non-2G GSM operating modes

The goal of this requirement is to ensure an adequate area where desired ABM signal is sufficiently strong to be heard clearly and a larger area where undesired ABM field is sufficiently low as to avoid undue annoyance. Qualifying measurement points shall fulfill the requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 75 measurement points.
- The secondary group shall include at least 300 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

3.4.5 2G GSM operating modes

If the 2G GSM operating mode(s) are selected for qualification, the qualifying measurement points shall fulfil the requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 25 measurement points.
- The secondary group shall include at least 125 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

3.5 HAC Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in ANSI C 63.19:2019. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Error Description	Uncertainty Value (%)	Probability Dist.	Divisor	ci ABM1	ci ABM2	Standard Uncertainty ABM1 (%)	Standard Uncertainty ABM2 (%)
Related to probe sensitivity							
Reference level	±3.0	N	1	1	1	±3.0	±3.0
AMCC geometry	±0.4	R	$\sqrt{3}$	1	1	±0.2	±0.2
AMCC current	±1.0	R	$\sqrt{3}$	1	1	±0.6	±0.6
Probe positioning during calibration	±0.1	R	$\sqrt{3}$	1	1	±0.1	±0.1
Noise distribution	±0.7	R	$\sqrt{3}$	0.0143	1	±0.0	±0.4
Frequency slope	±5.9	R	$\sqrt{3}$	0.1	1	±0.3	±3.4
Related to probe system							
Repeatability / drift	±1.0	R	$\sqrt{3}$	1	1	±0.6	±0.6
Linearity / dynamic range	±0.6	R	$\sqrt{3}$	1	1	±0.4	±0.4
Audio noise	±1.0	R	$\sqrt{3}$	0.1	1	±0.1	±0.6
Probe angle	±2.3	R	$\sqrt{3}$	1	1	±1.3	±1.3
Spectral Processing	±0.9	R	$\sqrt{3}$	1	1	±0.5	±0.5
Integration time	±0.6	N	1	1	5	±0.6	±3.0
Field distribution	±0.2	R	$\sqrt{3}$	1	1	±0.1	±0.1
Test signal							
Reference signal spectrum response	±0.6	R	$\sqrt{3}$	0	1	±0.0	±0.4
Positioning							
Probe positioning	±1.9	R	$\sqrt{3}$	1	1	±1.1	±1.1
Phantom Thickness	±0.9	R	$\sqrt{3}$	1	1	±0.5	±0.5
DUT positioning	±1.9	R	$\sqrt{3}$	1	1	±1.1	±1.1
External Contributions							
RF interference	±0.0	R	$\sqrt{3}$	1	0.3	±0.0	±0.0
Test Signal Variation	±2.0	R	$\sqrt{3}$	1	1	±1.2	±1.2
Combined Std. Uncertainty (ABM Field)						±4.1	±6.1
Expanded Std. Uncertainty (K=2)						±8.1	±12.2

4 MEASUREMENT SYSTEM

4.1 Definition of Hearing Aid Compatibility (HAC)

On July 10, 2003, the Federal Communications Commission (FCC) adopted new rules requiring wireless manufacturers and service providers to provide digital wireless phones that are compatible with hearing aids. The FCC has modified the exemption for wireless phones under the Hearing Aid Compatibility Act of 1998 (HAC Act) in WT Docket 01-309 RM-8658 to extend the benefits of wireless telecommunications to individuals with hearing disabilities. These benefits encompass business, social and emergency communications, which increase the value of the wireless network for everyone. An estimated more than 10% of the population in the United States show signs of hearing impairment and of that fraction, almost 80% use hearing aids. Approximately 500 million people worldwide suffer from hearing loss.

Compatibility Tests involved:

The standard calls for wireless communications devices to be measured for:

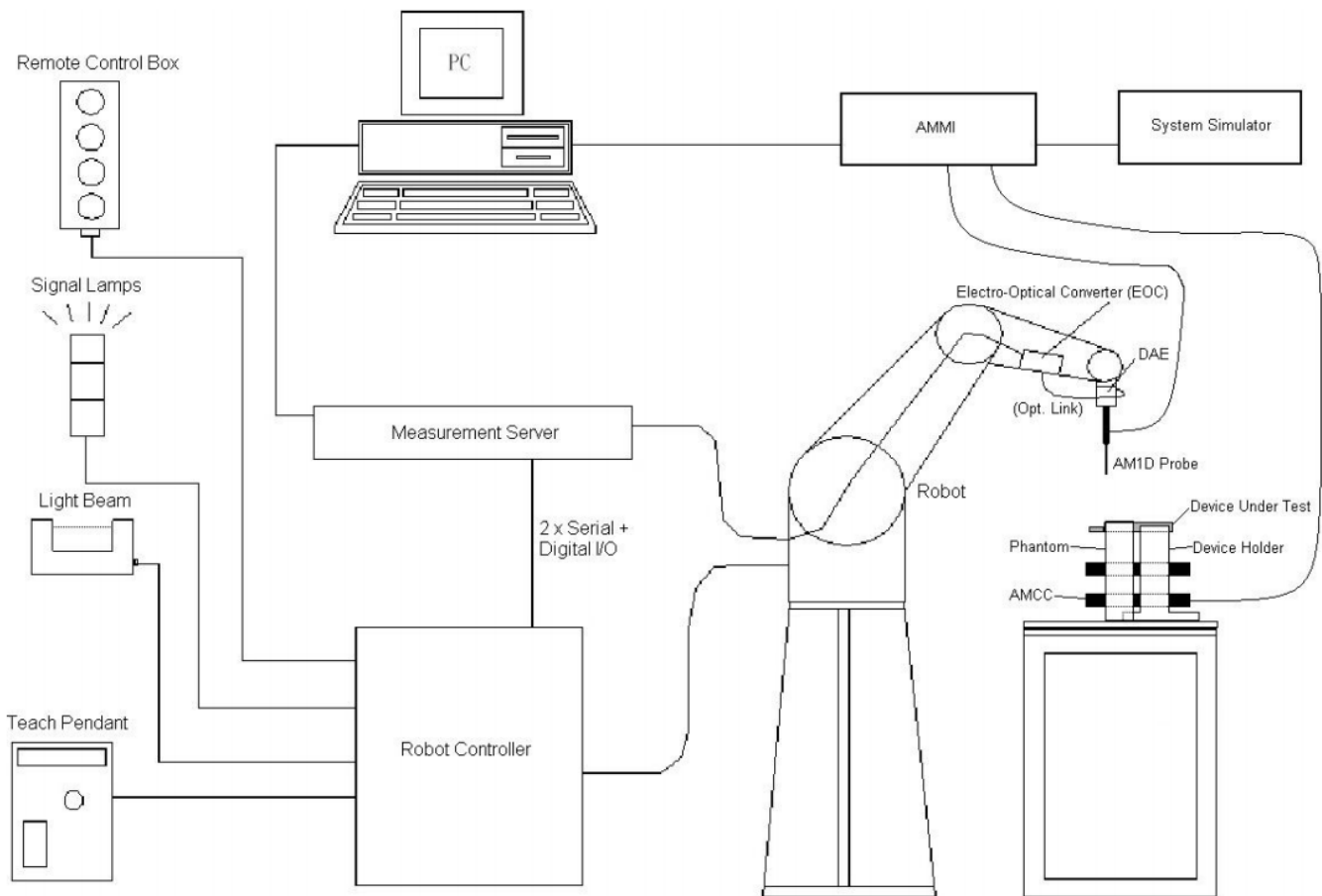
- RF Electric-field emissions.
- T-coil mode, magnetic-signal strength in the audio band.
- T-coil mode, magnetic-signal frequency response through the audio band.
- T-coil mode, magnetic-signal and noise articulation index.
- T-coil mode, acoustic-signal conversational gain in the audio band.
- T-coil mode, acoustic-signal frequency response through the audio band.
- T-coil mode, acoustic-signal distortion through audio band.

The hearing aid must be measured for:

- RF immunity in microphone mode
- RF immunity in T-coil mode

4.2 DASY HAC System

4.2.1 DASY HAC System Diagram:



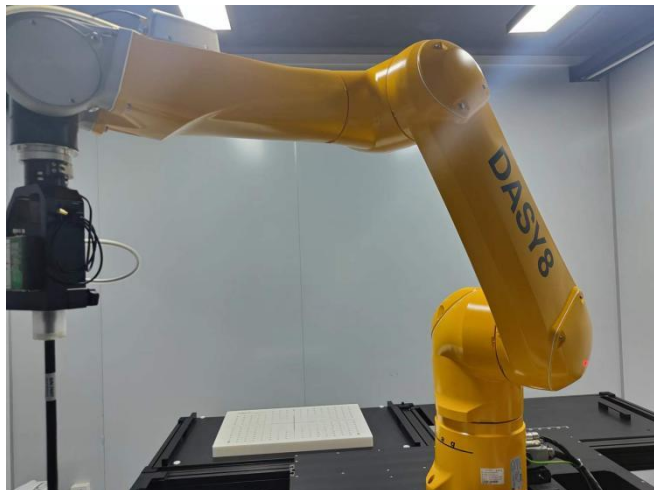
The DASY system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A E-field probe, the DASY software can define the area that is detected by the probe.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY8 measurement server.
6. The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
7. DASY8 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The device holder for handheld mobile phones.

System validation dipoles allowing to validate the proper functioning of the system.

4.2.2 Robot

The Dasy SAR system uses the high precision robots. Symmetrical design with triangular core Built-in optical fiber for surface detection system For the 6-axis controller system, Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents). The robot series have many features that are important for our application:



- High precision
(repeatability ± 0.02 mm)
- High reliability
(industrial design)
- Low maintenance costs
(virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements
(brush less synchron motors; no stepper motors)
- Low ELF interference
(motor control _elds shielded via the closed metallic construction shields)

4.2.3 Audio Magnetic Probe AM1DV3



Description	Active single sensor probe for both axial and radial measurement scans- Fully RF shielded, compatible with DAE, with adapted probe cup
Dynamic Range	0.1 KHz to 20 KHz
Sensitivity	<-50dB A/m @ 1KHz
Internal Amplifier	20dB
Dimensions	Overall length:296mm Tip diameter: 6.0 mm Sensor offset: 3.0 mm

4.2.4 Data Acquisition Electronics

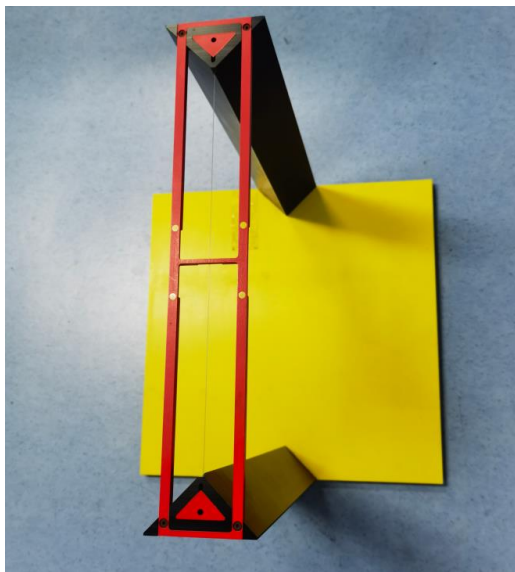
The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.



- Input Impedance: 200M Ω m
- The Inputs: Symmetrical and Floating
- Common Mode Rejection: Above 80dB

4.2.5 Test Arch

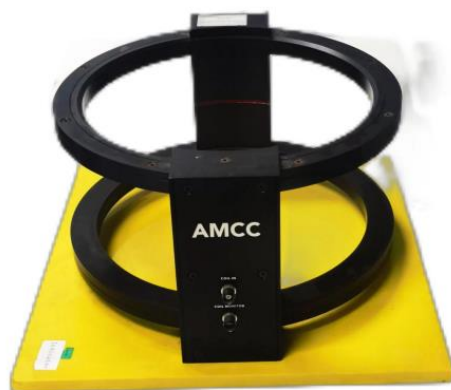
For the measurements the test Arch is able to easily and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot.



- Length: 370mm
- Width: 370mm
- Height: 370mm

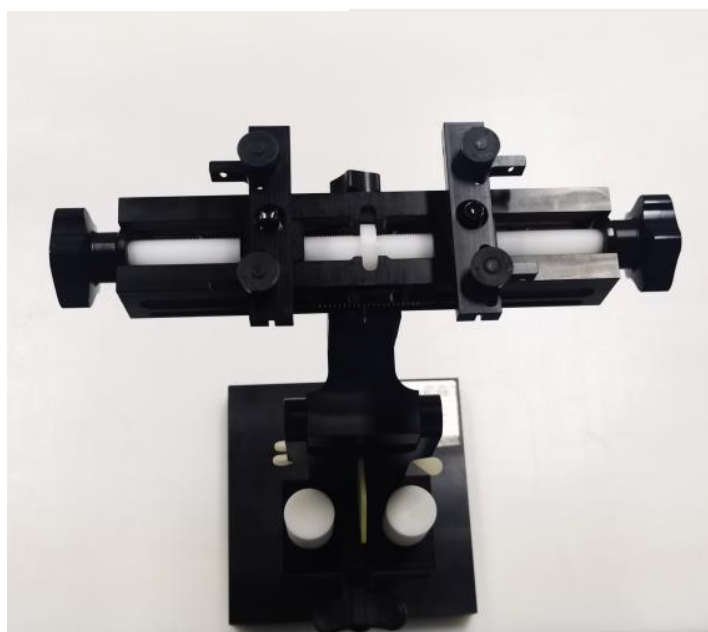
4.2.6 AMCC- Audio Magnetic Calibration Coil

Allows calibration of the complete measurement setup, the two horizontal coils create a homogeneous magnetic field in the z direction.



4.2.7 Device Holder

The Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to ANSI C63.19.



5 Test Procedures for all Technologies

5.1 Test Procedure for T-Coil signal per ANSI C63.19-2019, §6

This subclause describes the procedures used to measure the ABM (T-Coil) performance of the WD.

Measurements shall be performed over a measurement area 50 mm square, in the measurement plane, as specified in A.3. The measurement area shall be scanned with a uniform measurement point spacing of $2.0 \text{ mm} \pm 0.5 \text{ mm}$ in each X-Y axis of the plane, yielding 676 measurement points with approximately even spacing throughout the area.

Optionally, measurement point spacing may be increased to 4 mm, with interpolation employed to yield the required 676 equivalent measurement points distributed uniformly over the 50 mm square measurement area. Interpolated points shall be derived from the average of the linear representations of the field strengths of the nearest two or four equidistant measured points. The area of measurement is increased to a 52 mm square so that edge rows and columns of the required 50 mm square can be either measured or interpolated, with none extrapolated.

In addition to measuring the desired ABM signal levels, the weighted magnitude of the unintended signal shall also be determined. Weighting of the unintended and undesired ABM field shall be by the spectral and temporal weighting described in D.4 through D.6.

In order to assure that the required signal quality is measured, the measurement of the intended signal and the measurement of the unintended signal shall be made at the same locations. Measurements shall not include undesired influence from the WD's RF field; therefore, use of a coaxial connection to a base station simulator or non-radiating load might be necessary. However, even then with a coaxial connection to a base station simulator or non-radiating load there could still be RF leakage from the WD, which could interfere with the desired measurement. Pre-measurement checks should be made to avoid this possibility. All measurements shall be done with the WD operating on battery power with an appropriate normal speech audio signal input level given in Table 6.1. If the device display can be turned off during a phone call, then that may be done during the measurement as well. If tested with the display in the off state this shall be documented in the test report.

Measurements shall be performed with the probe coil oriented in the transverse direction, as illustrated in A.3, that is, aligned in the plane of the measurement area and perpendicular to the long dimension of the WD. A multi-stage sequence consists of first measuring the field strength of the desired T-Coil signal (desired ABM signal) that is useful to a hearing aid T-Coil at each specified measurement point. The undesired magnetic component (undesired ABM field) is then measured in the same transverse orientation at each of the same measurement points. At a single location only, taken at or near the highest desired ABM signal reading, the desired ABM signal frequency response shall be determined in a third measurement stage. The flowchart in Figure 6.3 illustrates this three-stage process.

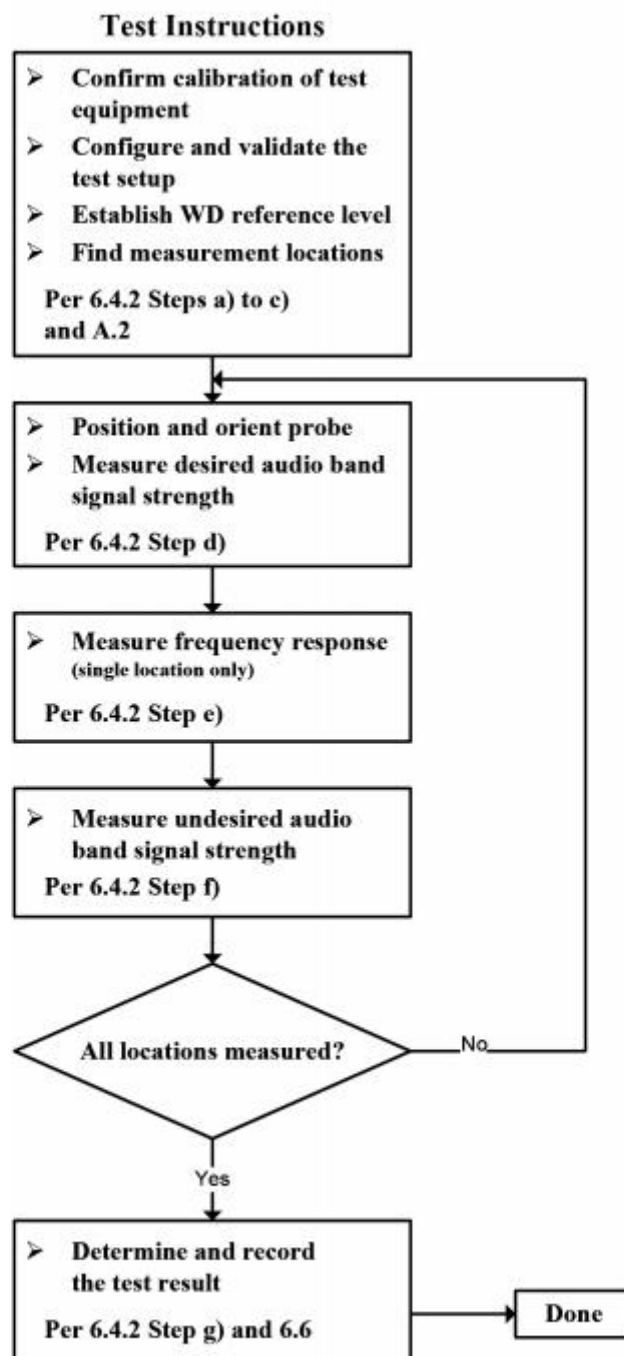


Figure 6.3—WD T-Coil signal test flowchart

To minimize the need to test every WD operating mode to the telecoil requirements of Clause 6, it is permissible to exclude some subset of supported configurations. For a given WD, every mode that supports voice communication shall be considered for telecoil testing. However, if it can be demonstrated that a certain configuration will not be the worst-case telecoil configuration, such configurations may be excluded from the full telecoil scans of 6.4.

34 For example, operating modes may be pre-screened by scanning for both desired ABM signal and undesired ABM field at a lower measurement point density than the final scans, thus saving considerable testing time by eliminating configurations that are excellent performers from more detailed testing for worst-case. In any case, the specific methods and criteria used to determine

which configurations are excluded for a WD shall be explicitly stated and justified in the test report. To be considered for exclusion from telecoil testing, operating modes shall also be shown to pass the frequency response requirements of 6.6.3.

Many factors could affect telecoil test results. RF power level and amplitude modulation characteristics as well as the specific current paths within the WD associated with the RF output stage(s), the display, and processing circuitry could affect the undesired ABM field. Audio codec implementation and acoustic receiver characteristics could also affect the desired ABM signal). Therefore, any justifications for exclusions should be thorough documented. If an operating mode is under user control and instructions on how to place the WD in a less interfering condition is in the user instructions, those instructions may be followed in configuring the device for testing.

The following steps summarize the basic test flow for determining desired ABM signal and undesired ABM field. These steps assume that a sine wave or narrowband 1/3 octave signal can be used for the measurement of desired ABM signal level. An alternative procedure, yielding equivalent results, using a broadband excitation is described in 6.5.

a) A validation of the test setup and instrumentation shall be performed. This may be done using a TMFS or Helmholtz Coil. Measure the emissions and confirm that they are within tolerance of the expected values.

b) Confirm that equipment that requires calibration has been calibrated, and that the noise level meets the requirements given in 6.3.2.

c) Position the WD in the test setup and connect the WD RF connector to a base station simulator or a non-radiating load (if necessary to control RF interference in the measurement equipment) as shown in Figure 6.1 or Figure 6.2.

d) The drive level to the WD is set such that the reference input level specified in Table 6.1 is input to the base station simulator (or manufacturer's test mode equivalent) in the 1 kHz, 1/3 octave band. This drive level shall be used for the T-Coil signal test (desired ABM signal) at $f = 1$ kHz. Either a sine wave at 1025 Hz, or a voice-like signal, band-limited to the 1 kHz 1/3 octave, as specified in 6.4.3, shall be used for the reference audio signal. If interference is found at 1025 Hz an alternative nearby reference audio signal frequency may be used.³⁵ The same drive level will be used for the desired ABM signal frequency response measurements at each 1/3 octave band center frequency. The WD volume control may be set at any level up to maximum, provided that a signal at any frequency at maximum modulation would not result in clipping or signal overload.

e) At each measurement location over the measurement area and in the transverse orientation, measure and record the desired 1 kHz T-Coil magnetic signal (desired ABM signal) as described in Step c).

f) At or near a location representing a maximum in the just-measured desired ABM signal, measure and record the desired T-Coil magnetic signals (desired ABM signal at f_i) as described in 6.4.5.2 in each individual ISO 266:1975 R10 standard 1/3 octave band. The desired audio band input frequency (f_i) shall be centered in each 1/3 octave band maintaining the same drive level as determined in Step c), and the reading taken for that band.³⁶

Equivalent methods of determining the frequency response may also be employed, such as fast Fourier transform (FFT) analysis using noise excitation or input–output comparison using simulated speech. The full-band integrated or half-band integrated probe output, as described in D.9, may be used, as long as the appropriate calibration curve is applied to the measured result, so as to yield an accurate measurement of the field magnitude. (The resulting measurement shall be an accurate measurement in dB(A/m).) Compare the frequency response found to the requirements

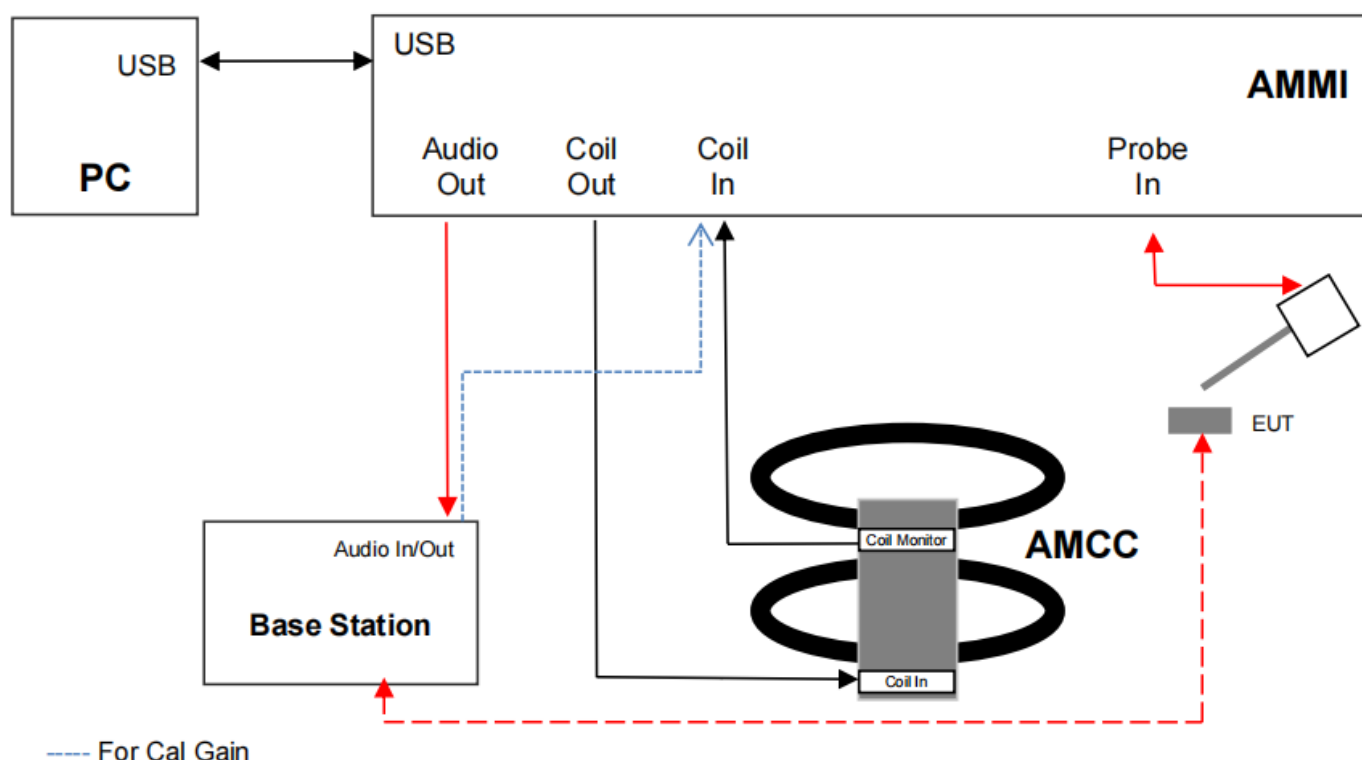
of 6.6.3.

g) At the same locations measured in Step d), measure and record the undesired broadband audio magnetic signal (undesired ABM field) with no audio signal applied (or digital zero applied, if appropriate) using the specified spectral weighting, the half-band integrator followed by the temporal weighting.

h) Calculate and record the location and number of the measurement points that satisfy both the minimum desired ABM signal level and the maximum undesired ABM field level specified in 6.6.2. Compare this to the requirements in 6.6.4 and record the result.

i) Calculate and record the location and number of the measurement points that satisfy the maximum undesired ABM field level and distribution requirements specified in 6.6.4.

Test Setup Diagram:



5.2 Reference input level

The following reference input levels (Figure 6.1) that correlate to a normal speech input level shall be used for the standard transmission protocols:

- GSM input level: -16dBm0
- UMTS input level: -16dBm0
- VoLTE input level: -16dBm0
- VoWiFi input level: -16dBm0

Table 6.1—Normal speech input levels

Standard	Protocol	Input (dBm0)
TIA-2000	CDMA	−18
TIA/EIA-136	TDMA (50 Hz)	−18
J-STD-007	GSM (217 Hz)	−16
T1/T1P1/3GPP (See Note 1)	UMTS (WCDMA)	−16
iDEN [®]	TDMA (22 Hz and 11 Hz)	−18
VoIP ^a (See Note 2)	Voice over Internet Protocol	−16
NOTE 1—For UMTS (Universal Mobile Telecommunications System), refer to 3GPP TS26.131 and TS26.132 (http://www.3gpp.org). NOTE 2—VoIP is used in this table as a general term specifying a group of voice services that use −16 dBm0 as their normal acoustic level. The group includes a variety of voice services, including Voice-over-LTE (VoLTE), Voice-over-IP-multimedia-subsystem (VoIMS), Voice-over-Wi-Fi (VoWiFi) and similar services. For 3G, LTE, and WLAN terminals used for Commercial Mobile Radio Service (CMRS) based telephony, refer to 3GPP TS26.131 and TS26.132.		

The manufacturer shall establish that −16 dBm0 is the normal acoustic level in order to place it in this category.

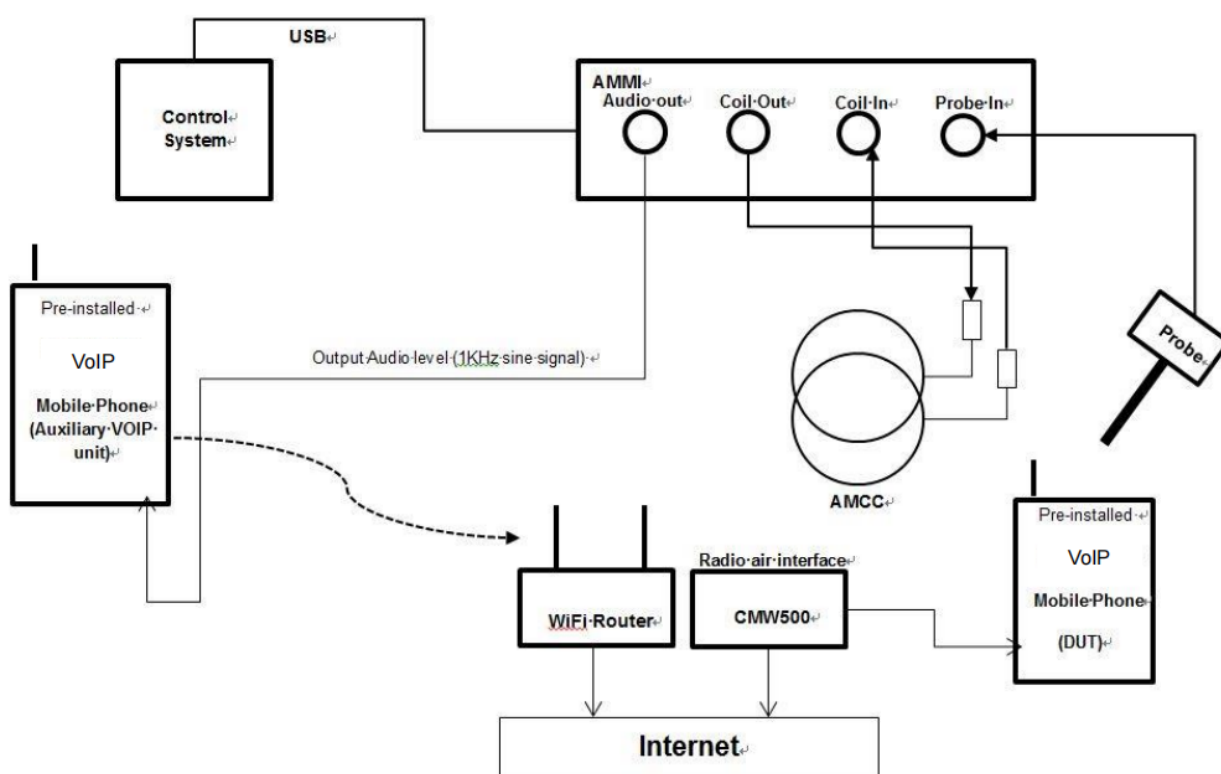
For protocols not listed in Table 6.1, use the normal speech input level per the relevant specifications for that air interface.

5.3 Over the Top(OTT)

This device supports VoIP via a preinstalled application that uses the FaceTime service, using ACC-ELD as its onh codec (refer to S8.1 for air interface details and s9.2.2 for codec bit rates). VoIP capabilities require HAC assessment when voice calls are supported over the cellular data connection via pre-installed VoIP applications.

The equipment is set up as shown below with a support device used to originate the call using the IP transport. The support device" connects to the cloud-based FaceTime service via a Wi-Fi access point and router. or an RJ45 Ethernet connection. The DUT connects to the VoIP service via a cellular/unlicensed air interface to the call box and an Ethernet connection from call box to internet, The various codec bit rate and air interface configurations are evaluated to determine the worst-case configuration (refer to S9.2).

Test Setup configuration for OTT calls:



6 Calibrations & Gain Measurements

Calibrations and Gain measurements are performed using guidance from SPEAG's DAS Y6/8 Module HAC System Handbook S7.3.

6.1 Calibration of AM1DVx Probe

For correct measurement of the audio-band magnetic field, the AM1DVx probe must first be calibrated. The calibration is performed in the Helmholtz Audio Magnetic Calibration Coil (AMCC).



6.2 Calibration Setup

During the calibration procedure, the system is set as described below:

- the AMMI is powered on and connected to the DASY6/8 PC via USB
- the AMMI COIL OUT port is connected to the AMCC COIL IN.
- the AMMI COIL IN port is connected to the AMCC COIL MONITOR
- the AM1DVx probe is mounted on the robot.

6.3 Sensor Angle Alignment

The sensor angle relative to the robot arm depends on several factors: probe connector angle, Data Acquisition Electronics (DAE) connector angle, use of a Quick Adaptor Change System (QACS). in DASY6/8, the sensor angle is assessed automatically during the alignment phase.

The alignment procedure consists of rotating the probe in the AMCC for angle within the $[0^\circ - 360^\circ]$ in 10° steps. The sensor angle is defined as the angle giving the maximum H-field response for the sensor. The angle corresponds to the sensor in the axial direction (same orientation as the AMCC field).

Note: The calibration must be repeated after any change in the measurement instrumentation, especially when the probe/ DAE has been remounted on the robot.

6.4 System Response Calibration

The sensitivity and frequency response of the AM1DVx probe is calibrated over the $[50\text{Hz} - 10\text{ kHz}]$ frequency range using a multi-sine signal. The sines are at the center frequency of each 1/3 octave band.

The measurement is performed in the AMCC with the probe sensor in axial orientation. The Coil in channel of the Audio Magnetic Measurement Instrument (AMMI) measures the voltage over the AMCC internal shunt, which is proportional to the magnetic field in the AMMI. in parallel, the Probe In channel measured the amplified signal picked up by the probe coil. The sensitivity of the probe in $\text{V}/(\text{Am})$ is defined at the voltage ratio at 1 kHz. The frequency response in dB is defined as the ratio between the voltages in each 1/3 octave band normalized to the 1 kHz ratio.

The obtained sensitivity is compared to the one from the probe configuration file for verification purposes. A warning is issued if the deviation exceeds 2 %.

6.5 AMMI Audio Output Calibration

The audio output calibration of the AMMI is performed as described below:

- Connect Audio Out to Coil in on the AMMI and click on Calibrate.
- Click on the Calibrate button.
- Once calibration is complete, re-establish the cabling illustrated in Test Setup Diagram \$5.1.

6.6 Codec/System Delay Measurements

Codec / system delay measurements are calculated using the guidance from SPEAG'S DASY6/8 Module HAC System Handbook S7.3.2.4:

- A time delay might occur in the audio signal path (latency of the codec, Windows settings ..). For accurate

measurements, the system must consider this delay, and shift in time the probe readings accordingly.

- Module HAC features automated measurement of the delay. The assessed delay will then be used for the subsequent desired ABM signal level and undesired ABM field level measurements.
- The delay is measured by pressing the Assess Delay button under the Scan Control section of the Measurement tab. The system must be ready to measure, and the DUT must be transmitting in the desired test mode.
- A scan with reduced resolution will be performed and the delay will be assessed at the measured maximum.
- This measurement must be repeated after every change in the hardware setup, or when a different DUT / Codec is used.

6.7 Compute Gain Settings

Gain settings are computed using the following procedure:

Define the Scan Type as Signal in the Scan Type section.

Specify the input Level and Codec Delay in the Base Station Simulator Settings.

1. Input level refers to full scale input level equivalent to 3.14 dBm0.
 - a) Input level of 1V is used for R&S CMW500 Base Station Simulator.
 - b) Input level of 1V is used for R&S CMX500.
2. The codec delay can be measured automatically using the procedure described above in §6.3 above.
3. Enter the desired speech level in dBm0. Refer to §5.2 for applicable Reference Input Levels.
4. Specify the audio file and the measurement duration to be used for the area and frequency response scans

Use Audio file 48k voice 1kHz 1s.wav for ABMd and ABMu measurements.

Use Audio file 48k voice 300-3000 2s.wav for Frequency Response measurements.

Click on Compute Gain Settings. The properties of the audio file, such as the bandwidth compensation factor (BWC), peak value, etc. will be automatically computed. In addition, the audio file scaling (also called gain) will be calculated. A popup is displayed in case the resulting gain exceeds the AMMI dynamic range.

6.8 Over the Top (OTT)

For GSM, WCDMA, LTE, 5G NR and Wi-Fi, the procedures outlined in §6.4 above were followed to compute the appropriate Gain settings for OTT measurements.

7 Investigations (Antenna, Codec, & Air Interface)

In order to comply with the requirements for T-Coil use, a WD's tested operating modes shall simultaneously meet the requirements for minimum desired ABM signal level and maximum undesired ABI field contained in this subclause at the minimum specified number of scanned locations.

When measured as specified in this standard, there are two groups of qualifying measurement points.

Primary group: A qualifying measurement point shall have its T-Coil signal, desired ABM signal, ≥ 18 dB(A/m) at 1 kHz, in a 1/3 octave band filter. These measurements shall be made with the WD operating at a reference input level as specified in Table 6.1. Simultaneously, the qualifying measurement point shall have its weighted magnetic noise undesired ABM field ≤ -38 dB(A/m).

Secondary group: A qualifying measurement point shall have its weighted magnetic noise, undesired ABM field ≤ -38 dB(A/m). This group inherently includes all the members of the primary group.

Non-2G GSM operating modes

Qualifying measurement points shall fulfill the requirements of 6.6.2; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 75 measurement points.
- The secondary group shall include at least 300 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

2G GSM operating modes

If the 2G GSM operating mode(s) are selected for qualification, the qualifying measurement points shall fulfil the requirements; both the primary and secondary group requirements shall be met:

- The primary group shall include at least 25 measurement points.
- The secondary group shall include at least 125 contiguous measurement points.

Additionally, to avoid an oddly shaped area of low noise, the secondary group shall include at least one longitudinal column of at least 10 contiguous qualifying points and at least one transverse row containing at least 15 contiguous qualifying points.

All operating modes

For all air interfaces, the maximum held-to-head output power was used for T-Coil evaluations. The maximum held-to-head output power is Mode A for WAN operating modes and Power State 1 Mode A for WLAN operating modes. Refer to S9 & S10 for T-Coil evaluations.

The worst-case configuration is determined by the lowest margin of Primary Group Contiguous Points. The margin Primary Group Contiguous Points is calculated by subtracting the Primary Group points coupling mode requirement (125 for GSM modes and 75 for non-GSM modes) from the measured Primary Group Contiguous Points. The lowest margin of Primary Group Contiguous Points will be highlighted in each table.

For WWAN technologies, the DUT utilizes an Antenna - Port mapping feature. A Port is a collection (cluster) of

antennas. Once the Port and Frequency Band has been selected, the transmitting Antenna is auto selected.

An investigation was performed to determine the worst-case Port for each Licensed technology. All subsequent measurements were determined by this investigation.

An investigation was performed to determine the worst-case WLAN Antenna. All subsequent measurements were determined by this investigation.



8 CMRS

8.1 Codec Investigation

An investigation between the various codec configurations (Low/Mid/High bit rates for Narrowband, Wideband and EVS) was performed to determine the worst-case bit rates for each voice service type. The table below compares the varying codec configurations. A codec investigation was performed on one band of each GSM, W-CDMA, LTE FDD LTE TDD, Wi-Fi 2.4GHz and Wi-Fi 5GHz.

GSM Codec Investigation

Band	Test Ch. /Freq.	Probe Position	Antenna	Codec	Bitrate (kbps)	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Point Count	Secondary Group Contiguous Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
GSM850	190/836.6	Transverse	Ant.1	AMR-NB	4.75	-50.36	98	385	20	26	73	260	PASS
	190/836.6	Transverse			7.4	-50.36	102	389	20	26	77	264	PASS
	190/836.6	Transverse			12.2	-50.36	100	387	20	26	75	262	PASS
	190/836.6	Transverse		AMR-WB	6.6	-50.36	111	397	20	26	86	272	PASS
	190/836.6	Transverse			8.85	-50.36	114	399	20	26	89	274	PASS
	190/836.6	Transverse			12.65	-50.36	115	412	20	26	90	287	PASS

Note: For GSM, it is observed that AMR-NB 4.75 kbps is the worst-case bit rate.

W-CDMA Codec Investigation

Band	Test Ch. /Freq.	Probe Position	Antenna	Codec	Bitrate (kbps)	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Point Count	Secondary Group Contiguous Point Count	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
WCDMA Band2	9400/1880	Transverse	Ant.1	AMR-NB	4.75	-50.36	126	405	24	26	51	105	PASS
	9400/1880	Transverse			7.4	-50.36	128	411	25	26	53	111	PASS
	9400/1880	Transverse			12.2	-50.36	125	402	25	26	50	102	PASS
	9400/1880	Transverse		AMR-WB	6.6	-50.36	138	400	25	26	63	100	PASS
	9400/1880	Transverse			15.85	-50.36	136	395	25	26	61	95	PASS
	9400/1880	Transverse			23.85	-50.36	135	392	25	26	60	92	PASS

Note: For W-CDMA, it is observed that AMR-NB 12.2 kbps is the worst-case bit rate.



VoLTE Codec Investigation

Band	Test Ch. /Freq.	Probe Position	Antenna	Codec	Bitrate (kbps)	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
LTE Band2	18900/1880	Transverse	Ant.1	AMR-NB	4.75	-50.18	148	378	25	26	73	78	PASS
	18900/1880	Transverse			7.4	-50.18	146	371	25	26	71	71	PASS
	18900/1880	Transverse			12.2	-50.18	143	369	25	26	68	69	PASS
	18900/1880	Transverse		AMR-WB	6.6	-50.18	182	380	25	26	107	80	PASS
	18900/1880	Transverse			15.85	-50.18	180	376	25	26	105	76	PASS
	18900/1880	Transverse			23.85	-50.18	176	367	23	26	101	67	PASS
	18900/1880	Transverse		EVS-NB	5.9	-50.18	139	340	20	26	64	40	PASS
	18900/1880	Transverse			8	-50.18	141	345	20	26	66	45	PASS
	18900/1880	Transverse			13.2	-50.18	136	333	19	26	61	33	PASS
	18900/1880	Transverse		EVS-WB	5.9	-50.18	145	332	19	26	70	32	PASS
	18900/1880	Transverse			8	-50.18	146	328	19	26	71	28	PASS
	18900/1880	Transverse			13.2	-50.18	143	324	18	26	68	24	PASS
LTE Band41	40620/2593	Transverse	Ant.1	AMR-NB	4.75	-50.25	142	365	24	26	67	65	PASS
	40620/2593	Transverse			7.4	-50.25	138	356	24	26	63	56	PASS
	40620/2593	Transverse			12.2	-50.25	140	362	24	26	65	62	PASS
	40620/2593	Transverse		AMR-WB	6.6	-50.25	169	375	25	26	94	75	PASS
	40620/2593	Transverse			15.85	-50.25	171	377	25	26	96	77	PASS
	40620/2593	Transverse			23.85	-50.25	165	369	25	26	90	69	PASS
	40620/2593	Transverse		EVS-NB	5.9	-50.25	136	322	17	26	61	22	PASS
	40620/2593	Transverse			8	-50.25	138	325	18	26	63	25	PASS
	40620/2593	Transverse			13.2	-50.25	132	315	16	26	57	15	PASS
	40620/2593	Transverse		EVS-WB	5.9	-50.25	140	329	18	26	65	29	PASS
	40620/2593	Transverse			8	-50.25	144	332	19	26	69	32	PASS
	40620/2593	Transverse			13.2	-50.25	142	330	19	26	67	30	PASS

Note:

For LTE-FDD, it is observed that EVS-NB 13.2 kbps is the worst-case bit rate.

For LTE-TDD, it is observed that EVS-NB 13.2 kbps is the worst-case bit rate.

VoWiFi Codec Investigation

Band	Test Ch. /Freq.	Probe Position	Antenna	Codec	Bitrate (kbps)	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
802.11b 1Mbps 20MHz BW	6/2437	Transverse	Ant.1	AMR-NB	4.75	-50.12	149	371	25	26	74	71	PASS
	6/2437	Transverse			7.4	-50.12	146	358	26	26	71	58	PASS
	6/2437	Transverse			12.2	-50.12	148	365	25	26	73	65	PASS
	6/2437	Transverse		AMR-WB	6.6	-50.12	189	355	25	26	114	55	PASS
	6/2437	Transverse			15.85	-50.12	192	365	26	26	117	65	PASS
	6/2437	Transverse			23.85	-50.12	200	370	26	26	125	70	PASS
	6/2437	Transverse		EVS-NB	5.9	-50.12	146	315	22	26	71	15	PASS
	6/2437	Transverse			8	-50.12	148	320	23	26	73	20	PASS
	6/2437	Transverse			13.2	-50.12	144	311	22	26	69	11	PASS
	6/2437	Transverse		EVS-WB	5.9	-50.12	146	328	20	26	71	28	PASS
	6/2437	Transverse			8	-50.12	148	332	21	26	73	32	PASS
	6/2437	Transverse			13.2	-50.12	145	329	20	26	70	29	PASS
802.11ac MCS0 20MHz BW	36/5180	Transverse	Ant.1	AMR-NB	4.75	-49.89	150	362	25	26	75	62	PASS
	36/5180	Transverse			7.4	-49.89	149	368	26	26	74	68	PASS
	36/5180	Transverse			12.2	-49.89	146	362	25	26	71	62	PASS
	36/5180	Transverse		AMR-WB	6.6	-49.89	184	356	26	26	109	56	PASS
	36/5180	Transverse			15.85	-49.89	186	366	26	26	111	66	PASS
	36/5180	Transverse			23.85	-49.89	188	371	26	26	113	71	PASS
	36/5180	Transverse		EVS-NB	5.9	-49.89	148	315	22	26	73	15	PASS
	36/5180	Transverse			8	-49.89	146	312	21	26	71	12	PASS
	36/5180	Transverse			13.2	-49.89	143	310	21	26	68	10	PASS
	36/5180	Transverse		EVS-WB	5.9	-49.89	145	328	21	26	70	28	PASS
	36/5180	Transverse			8	-49.89	146	330	20	26	71	30	PASS
	36/5180	Transverse			13.2	-49.89	148	335	20	26	73	35	PASS

Note:

For WiFi2.4G, it is observed that EVS-NB 13.2 kbps is the worst-case bit rate.

For WiFi5G, it is observed that EVS-NB 13.2 kbps is the worst-case bit rate.

8.2 Air Interface Investigation

A limited set of bands/channels/bandwidths were evaluated to confirm that there is no effect to the ABM levels when changing the band/channel/bandwidth.

GSM Air Interface Investigation

Band	Codec	Bitrate (kbps)	Probe Position	Antenna	Test Ch. /Freq.	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
GSM	AMR-NB	4.75	Transverse	Ant. 1	128/824.2	-50.23	100	388	21	26	25	88	PASS
			Transverse		190/836.6	-50.36	98	385	20	26	23	85	PASS
			Transverse		251/848.8	-50.23	100	386	21	26	25	86	PASS

Note:
For all subsequent tests for GSM, Middle channel was used in conjunction with the worst-case bit rate found.

WCDMA Air Interface Investigation

Band	Codec	Bitrate (kbps)	Probe Position	Antenna	Test Ch. /Freq.	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
WCDMA Band2	AMR-NB	12.2	Transverse	Ant. 1	9262/1852.4	-50.36	128	403	25	26	53	103	PASS
			Transverse		9400/1880	-50.36	125	402	25	26	50	102	PASS
			Transverse		9538/1907.6	-50.36	126	401	25	26	51	101	PASS

Note:
For all subsequent tests for WCDMA, Middle channel was used in conjunction with the worst-case bit rate found.

VoLTE Air Interface Investigation

Band	Codec	Bitrate (kbps)	Probe Position	Antenna	Test Ch. /Freq.	Bandwidth	RB Allocation	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
LTE Band2 QPSK	EVS-NB	13.2	Transverse	Ant. 1	18900/1880	20MHz	1/0	-50.18	136	333	19	26	61	33	PASS
							100/0	-50.18	138	338	19	26	63	38	PASS
LTE Band2 QPSK	EVS-NB	13.2	Transverse	Ant. 1	18700/1860	20MHz	1/0	-50.18	140	340	20	26	65	40	PASS
LTE Band2 QPSK	EVS-NB	13.2	Transverse	Ant. 1	19100/1900	20MHz	1/0	-50.18	139	336	20	26	64	36	PASS
LTE Band2 16QAM	EVS-NB	13.2	Transverse	Ant. 1	18900/1880	20MHz	1/0	-50.18	141	342	21	26	66	42	PASS
LTE Band2 QPSK	EVS-NB	13.2	Transverse	Ant. 1	18900/1880	1.4MHz	1/0	-50.18	139	336	19	26	64	36	PASS
LTE Band41 QPSK	EVS-NB	13.2	Transverse	Ant. 1	18900/1880	20MHz	1/0	-50.25	132	315	16	26	57	15	PASS
							100/0	-50.25	136	321	16	26	61	21	PASS
LTE Band41 QPSK	EVS-NB	13.2	Transverse	Ant. 1	18700/1860	20MHz	1/0	-50.25	138	319	17	26	63	19	PASS
LTE Band41 QPSK	EVS-NB	13.2	Transverse	Ant. 1	19100/1900	20MHz	1/0	-50.25	140	326	17	26	65	26	PASS

LTE Band41 16QAM	EVS-NB	13.2	Transverse	Ant. 1	18900/1880	20MHz	1/0	-50.25	139	320	16	26	64	20	PASS
LTE Band41 QPSK	EVS-NB	13.2	Transverse	Ant. 1	18900/1880	1.4MHz	1/0	-50.25	142	328	18	26	67	28	PASS
Note: For all subsequent tests for LTE-FDD, middle channel, QPSK modulation, and 1% RB size and low RB allocation was used in conjunction with the worst-case bit rate found. For all subsequent tests for LTE-TDD, middle channel, QPSK modulation, and 1% RB size and low RB allocation was used in conjunction with the worst-case bit rate found.															

VoWiFi Air Interface Investigation

Band	Codec	Bitrate (kbps)	Probe Position	Antenna	Test Ch. /Freq.	Bandwidth	Modulation / Mode	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response
802.11b	EVS-NB	13.2	Transverse	WLAN	6/2437	20MHz	1M	-50.3	144	311	22	26	69	11	PASS
							11M	-50.3	148	318	22	26	73	18	PASS
802.11g	EVS-NB	13.2	Transverse	WLAN	6/2437	20MHz	6M	-50.3	146	320	23	26	71	20	PASS
							54M	-50.3	145	316	22	26	70	16	PASS
802.11n(HT20)	EVS-NB	13.2	Transverse	WLAN	6/2437	20MHz	MCS0	-50.3	150	323	23	26	75	23	PASS
							MCS7	-50.3	147	321	22	26	72	21	PASS
802.11a	EVS-NB	13.2	Transverse	WLAN	36/5180	20MHz	6M	-49.93	149	326	22	26	74	26	PASS
							54M	-49.93	152	332	23	26	77	32	PASS
802.11n(HT20)	EVS-NB	13.2	Transverse	WLAN	36/5180	20MHz	6M	-49.93	153	330	23	26	78	30	PASS
							54M	-49.93	149	328	22	26	74	28	PASS
802.11n(HT40)	EVS-NB	13.2	Transverse	WLAN	38/5190	40MHz	MCS0	-49.93	156	326	22	26	81	26	PASS
							MCS7	-49.93	149	316	21	26	74	16	PASS
802.11ac(VHT20)	EVS-NB	13.2	Transverse	WLAN	36/5180	20MHz	MCS0	-49.93	143	310	21	26	68	10	PASS
							MCS8	-49.93	145	312	21	26	70	12	PASS
802.11ac(VHT40)	EVS-NB	13.2	Transverse	WLAN	38/5190	40MHz	MCS0	-49.93	148	318	20	26	73	18	PASS
							MCS9	-49.93	150	320	22	26	75	20	PASS
802.11ac(VHT80)	EVS-NB	13.2	Transverse	WLAN	42/5210	80MHz	MCS0	-49.93	151	322	21	26	76	22	PASS
							MCS9	-49.93	146	316	21	26	71	16	PASS
Note: For all subsequent tests for Wifi2.4G,802.11b was used in conjunction with the worst-case bit rate found. For all subsequent tests for Wifi5G,802.11ac(VHT20) was used in conjunction with the worst-case bit rate found.															

9 HAC T -Coil Test Results

Antenna, Codec (bit rates) and Air Interface investigations were conducted on CMRS voice services (Codec bit rate was measured separately for OTT voice services refer to s9.2.1). The worst-case antenna, codec (bit rate) and all interface configurations were used for final T-Coil testing for CMRS and OTT voice services. Please refer to tables below for final T-Coil Test Results.

9.1 GSM Test Results

CMRS

Band	Test Ch. /Freq.	Probe Position	Antenn a	Codec	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Point Count	Secondary Group Contiguou s Point Count	Secondary Group Max Longitudina l	Secondary Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondary Group Contiguou s Pts Margin	Frequenc y Response	Plots Numbe r
GSM850	190/836. 6	Transvers e	Ant.1	AMR- NB	4.75	-50.36	98	385	20	26	73	260	PASS	1#
GSM190 0	661/1880	Transvers e	Ant.1	AMR- NB	4.75	-50.36	104	389	20	26	79	264	PASS	2#

OTT-EDGE

Band	Test Ch. /Freq.	Probe Position	Antenn a	Code c	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Point Count	Secondary Group Contiguou s Point Count	Secondary Group Max Longitudina l	Secondary Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondary Group Contiguou s Pts Margin	Frequenc y Response	Plots Numbe r
GSM850	190/836. 6	Transvers e	Ant.1	OPUS	6	-50.36	102	398	20	26	77	273	PASS	/
GSM850	190/836. 6	Transvers e	Ant.1	OPUS	40	-50.36	100	396	20	26	75	271	PASS	/
GSM850	190/836. 6	Transvers e	Ant.1	OPUS	75	-50.36	98	387	20	26	73	262	PASS	22#
GSM190 0	661/1880	Transvers e	Ant.1	OPUS	75	-50.36	107	395	20	26	82	270	PASS	23#

9.2 WCDMA Test Results

CMRS

Band	Test Ch. /Freq.	Probe Position	Antenn a	Codec	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Point Count	Secondar y Group Contiguou s Point Count	Secondary Group Max Longitudin al	Secondar y Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondar y Group Contiguou s Pts Margin	Frequenc y Respons e	Plots Numbe r
WCDMA Band2	9400/1880	Transvers e	Ant.1	AMR- NB	12.2	-50.36	125	402	25	26	50	102	PASS	3#
WCDMA Band4	1412/1732. 4	Transvers e	Ant.1	AMR- NB	12.2	-50.36	115	395	24	26	40	95	PASS	4#
WCDMA Band5	4183/836.6	Transvers e	Ant.1	AMR- NB	12.2	-50.36	111	387	25	26	36	87	PASS	5#

OTT-HSPA

Band	Test Ch. /Freq.	Probe Position	Antenn a	Code c	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Point Count	Secondar y Group Contiguou s Point Count	Secondary Group Max Longitudin al	Secondar y Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondar y Group Contiguou s Pts Margin	Frequenc y Respons e	Plots Numbe r
WCDMA Band2	9400/1880	Transvers e	Ant.1	OPU S	6	-50.36	118	398	25	26	43	98	PASS	/
WCDMA Band2	9400/1880	Transvers e	Ant.1	OPU S	40	-50.36	116	395	25	26	41	95	PASS	/
WCDMA Band2	9400/1880	Transvers e	Ant.1	OPU S	75	-50.36	115	392	25	26	40	92	PASS	24#
WCDMA Band4	1412/1732. 4	Transvers e	Ant.1	OPU S	75	-50.36	108	389	25	26	33	89	PASS	25#
WCDMA Band5	4183/836.6	Transvers e	Ant.1	OPU S	75	-50.36	118	395	25	26	43	95	PASS	26#

9.3 VoLTE Test Results

VoLTE

Band	Test Ch. /Freq.	Probe Position	Antenn a	Codec	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Point Count	Secondar y Group Contiguou s Point Count	Secondary Group Max Longitudin al	Secondar y Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondar y Group Contiguou s Pts Margin	Frequenc y Respons e	Plots Numbe r
LTE Band2	18900/1880	Transvers e	Ant.1	EVS- NB	13.2	-50.18	136	333	19	26	61	33	PASS	6#
LTE Band4	20175/1732. 5	Transvers e	Ant.1	EVS- NB	13.2	-50.18	125	315	18	26	50	15	PASS	7#
LTE Band5	20525/836.5	Transvers e	Ant.1	EVS- NB	13.2	-50.18	129	319	19	26	54	19	PASS	8#
LTE Band12	23095/707.5	Transvers e	Ant.1	EVS- NB	13.2	-50.18	148	348	20	26	73	48	PASS	9#
LTE Band13	23230/782	Transvers e	Ant.1	EVS- NB	13.2	-50.18	141	339	20	26	66	39	PASS	10#
LTE Band17	23790/710	Transvers e	Ant.1	EVS- NB	13.2	-50.18	146	346	20	26	71	46	PASS	11#
LTE Band25	26365/1882. 5	Transvers e	Ant.1	EVS- NB	13.2	-50.18	129	329	20	26	54	29	PASS	12#
LTE Band26	26865/831.5	Transvers e	Ant.1	EVS- NB	13.2	-50.18	138	338	20	26	63	38	PASS	13#
LTE Band66	132322/174 5	Transvers e	Ant.1	EVS- NB	13.2	-50.18	131	331	20	26	56	31	PASS	14#
LTE Band71	133322/683	Transvers e	Ant.1	EVS- NB	13.2	-50.18	135	328	19	26	60	28	PASS	15#
LTE Band41	40620/2593	Transvers e	Ant.1	EVS- NB	13.2	-50.25	132	315	16	26	57	15	PASS	16#

OTT-VoLTE

Band	Test Ch. /Freq.	Probe Position	Antenn a	Code c	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Point Count	Secondar y Group Contiguou s Point Count	Secondary Group Max Longitudin al	Secondar y Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondar y Group Contiguou s Pts Margin	Frequenc y Respons e	Plots Numbe r
LTE Band2	18900/1880	Transvers e	Ant.1	OPU S	6	-50.18	128	320	19	26	53	20	PASS	/
LTE Band2	18900/1880	Transvers e	Ant.1	OPU S	40	-50.18	127	321	19	26	52	21	PASS	/
LTE Band2	18900/1880	Transvers e	Ant.1	OPU S	75	-50.18	125	316	18	26	50	16	PASS	27#

LTE Band4	20175/1732. 5	Transvers e	Ant.1	OPU S	75	-50.18	134	323	18	26	59	23	PASS	28#
LTE Band5	20525/836.5	Transvers e	Ant.1	OPU S	75	-50.18	123	313	18	26	48	13	PASS	29#
LTE Band12	23095/707.5	Transvers e	Ant.1	OPU S	75	-50.18	143	343	20	26	68	43	PASS	30#
LTE Band13	23230/782	Transvers e	Ant.1	OPU S	75	-50.18	141	341	20	26	66	41	PASS	31#
LTE Band17	23790/710	Transvers e	Ant.1	OPU S	75	-50.18	135	334	20	26	60	34	PASS	32#
LTE Band25	26365/1882. 5	Transvers e	Ant.1	OPU S	75	-50.18	137	338	19	26	62	38	PASS	33#
LTE Band26	26865/831.5	Transvers e	Ant.1	OPU S	75	-50.18	134	336	20	26	59	36	PASS	34#
LTE Band66	132322/174 5	Transvers e	Ant.1	OPU S	75	-50.18	129	328	20	26	54	28	PASS	35#
LTE Band71	133322/683	Transvers e	Ant.1	OPU S	75	-50.18	126	325	19	26	51	25	PASS	36#
LTE Band41	40620/2593	Transvers e	Ant.1	OPU S	75	-50.25	131	326	19	26	56	26	PASS	37#



9.4 VoWiFi Test Results

VoWiFi

Band	Test Ch. /Freq.	Probe Position	Antenn a	Codec	Bitrat e (kbps)	Ambient Primary Group Contiguou s Pts	Primary Group Contiguou s Pts	Secondary Group Contiguou s Pts	Secondary Group Max Longitudina l	Secondary Group Max Transvers e	Primary Group Contiguou s Pts Margin	Secondary Group Contiguou s Pts Margin	Frequenc y Response	Plots Numbe r
802.11b 1Mbps 20MHz BW	6/2437	Transvers e	WLAN	EVS- NB	13.2	-50.12	144	311	22	26	69	11	PASS	17#
802.11a c MCS0 20MHz BW	36/5180	Transvers e	WLAN	EVS- NB	13.2	-49.89	143	310	21	26	68	10	PASS	18#
	60/5300	Transvers e		EVS- NB	13.2	-49.89	150	320	20	26	75	20	PASS	19#
	116/5580	Transvers e		EVS- NB	13.2	-49.89	138	305	19	26	63	5	PASS	20#
	157/5785	Transvers e		EVS- NB	13.2	-49.89	134	301	18	26	59	1	PASS	21#

OTT-VoWiFi

Band	Test Ch. /Freq.	Probe Position	Antenna	Codec	Bitrate (kbps)	Ambient Primary Group Contiguous Pts	Primary Group Contiguous Pts	Secondary Group Contiguous Pts	Secondary Group Max Longitudinal	Secondary Group Max Transverse	Primary Group Contiguous Pts Margin	Secondary Group Contiguous Pts Margin	Frequency Response	Plots Number
802.11b 1Mbps 20MHz BW	6/2437	Transverse	WLAN	OPUS	6	-50.12	151	322	24	26	76	22	PASS	/
	6/2437	Transverse	WLAN	OPUS	40	-50.12	150	320	24	26	75	20	PASS	/
	6/2437	Transverse	WLAN	OPUS	75	-50.12	147	315	24	26	72	15	PASS	38#
802.11ac MCS0 20MHz BW	36/5180	Transverse	WLAN	OPUS	6	-49.89	146	315	22	26	71	15	PASS	/
	36/5180	Transverse	WLAN	OPUS	40	-49.89	147	316	22	26	72	16	PASS	/
	36/5180	Transverse	WLAN	OPUS	75	-49.89	144	313	22	26	69	13	PASS	39#
	60/5300	Transverse	WLAN	OPUS	75	-49.89	146	313	20	26	71	13	PASS	40#
	116/5580	Transverse	WLAN	OPUS	75	-49.89	140	310	18	26	65	10	PASS	41#
	157/5785	Transverse	WLAN	OPUS	75	-49.89	167	325	19	26	92	25	PASS	42#

10 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
Test Software	Speag	DASY8	1.2.4.4345	N/A	N/A
Data Acquisition Electronics	Speag	DAE4	SN: 1710	2026/01/12	2027/01/11
Audio Magnetic 1D Field Probe	Speag	AM1DV3	3073	2026/02/18	2027/02/17
Wireless Communication Test Set	R&S	CMW500	167190	2026/03/24	2027/03/23
Thermometer	Elitech	RC-4HC	EF7239002655	2025/10/29	2026/10/28
Audio Magnetic Calibration Coil	Speag	AMCC	SN: 1096	NCR	NCR
Audio Measuring Instrument	Speag	AMMI	SN: 1118	NCR	NCR
Test Arch Phantom	Speag	N/A	N/A	NCR	NCR
Phone Positioner	Speag	N/A	N/A	NCR	NCR
Note: 1. NCR: "No-Calibration Required"					

11 REFERENCES

- 1 FCC 47 CFR Part 20.19 "Hearing aid-compatible mobile handsets."
- 2 ANSI C 63.19:2019 "American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids", 19 August 2019
- 3 KDB 285076 D01 HAC Guidance v06, "provides equipment authorization guidance for mobile handsets subject to the requirements of Section 20.19 for hearing aid compatibility
- 4 KDB 285076 D02, T-Coil testing for CMRS IP v01r01 provides guidance for T-Coil tests for voice-over-IP (e.g. LTE and Wi-Fi) CMRS based Telephone Services.



ANNEX A HAC T-Coil RESULT

Please refer the document "Ti-CC26050326-HTD.pdf".

ANNEX B TEST SETUP PHOTO

Please refer the document "Ti-CC26050326-AS-3.pdf".

ANNEX C EUT EXTERNAL PHOTO

Please refer the document "Ti-CC26050326-AW.pdf".

ANNEX D CALIBRATION REPORT

Please refer the document "Ti-CC26050326-AC-3.pdf".

--END OF REPORT--

